

Intracapsular fracture of the neck femur in age group between 20-50 years ,the result of Internal fixation with cannulated screws

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الاستنتاج:

إن كسر عنق عظم الفخذ يعتبر من المواضيع المهمة وذلك لما تحتويه من مضاعفات خطيرة قد تؤدي إلى موات رأس العظم مما قد يسبب سوفان مبكر لمفصل الورك.

هنالك العديد من العوامل التي تسبب المضاعفات التي قد تحصل يمكن التحكم فيها مما قد يقلل حصول تلك المضاعفات ومنها : التشخيص المبكر للكسر،سرعة إجراء عملية تثبيت الكسر بواسطة البراغي المثقبة مع الحفاظ على قوام العظم في وضعة الأصلي ما قبل الكسر .

و لقد أثبتت هذه الدراسة مدى كفاء تثبيت الكسر بواسطة البراغي المثقبة من خلال النسبة العالية للأتام الكسر مع قلة حصول المضاعفات مقارنة بالدراسات الأخرى

ABSTRACT

Background:

Femoral neck fracture represent important subject because it has many complications and followed by morbidity , prospective study was done on (20) patient, The treatment options of femoral neck fracture are many ,we choose treatment with cannulated screws and evaluatethe result of it regarding the union rate and occurrence of the complications.

Patients and Methods:

This study was performed on 20 patients with femoral neck fractures in period between September 2009 and September 2010 in orthopedic department in the Hospital for Specialized Surgeries in medical city/ Baghdad ,we did preoperative assessment to them and including radiological examination ,laboratory investigations to identify medical diseases and treat them ,classify patient according garden classification and Treated by reduction of displaced fractures and capsulotomy and then fixation with three cannulated screw

Results:

Twenty patients with femoral neck fractures 7 females 35%, and 13 males 65%, 12 patients were left-sided 60%, 8 patients were right-sided 40%.11 patients were with undisplaced femoral neck fractures (55%), 9 patients with displaced femoral neck fractures (45%). The age of the patients was ranging from 20 – 50year ,The result of our study was indicated that union rate of 85% , and 25% of vascular necrosis.

Conclusions:

the cannulated hip screws is a good method of fixation regarding union rate and low complication rate , the result of treatment is influenced mainly by the fracture displacement and quality of reduction and time of surgery.

Key wards:

Fracture neck femur, cannulated screws, avascular necrosis, and nonunion.

Introduction

Femoral neck fractures occur between the end of articular surface of the femoral head and the intertrochanter region ⁽¹⁾

Between 220,000 and 250,000 femoral fractures occur in the United States each year ⁽²⁾. The number and severity of femoral neck

fractures are increasing rapidly as average age of in population decrease .⁽³⁾

In the case of young individuals who sustain a femoral neck fracture, the resultant trauma is major, usually resulting in a direct force along the shaft of the femur ¹

The most commonly used classification system for femoral neck fractures is the Garden system .

Garden I: fractures are incomplete and usually impacted with femoral head tilted in the posterolateral direction

Garden II: fractures are complete but non displaced

Garden III:fractures are complete and partially displaced .

Garden IV: fractures are completely displaced

Surgical treatment:

Operative treatment is favored for femoral neck fractures ^(4,5). In young patients, it is necessary to obtain reduction of the femoral neck fracture as soon as possible to decrease the risk of avascular necrosis. Anatomic reduction and subsequent fixation are the goals of surgery.

Young patients usually undergo closed or open reduction, with fixation by three cannulated lag screws

Parallel Cancellous Lag Screws

The mechanism for stabilizing the femoral neck and head has been described by many configuration , but the preferred method seems to be that of a triangle or inverted triangular configuration with the first screw running along the calcar, controlling inferior displacement of the head of the femur by having the shaft of the screw resting right on the calcar. The second screw is placed posterosuperior, along the neck of the femur, with the shaft of the screw being as close as possible to the posterior cortex of the femoral neck. This screw is used to prevent the femoral head from drifting posteriorly. A final screw is placed anterior superior, as additional support. The inverted triangle may also reduce the chance of a stress fracture occurring at the level of the lesser trochanter . However, some surgeons report the triangle configuration to be stronger and better able to resist deformation. Successful use of three or four screws for both nondisplaced and displaced fractures have

been reported in some studies . The fourth screw, if added, should be placed along the posterior cortex of the neck and would be indicated to support gross posterior comminution. The importance of initiating the screw fixation above the level of the lesser trochanter cannot be over emphasized^(2,6,7,8.)

Patients and method:

A prospective study was done on 20 patients with femoral neck fractures selected randomly in age group (20-50) years old with mean of 33.3 years , In orthopedic department in the Hospital for Specialized Surgeries in medical city/ Baghdad, between September 2009 and September 2010.

The 20 patients with femoral neck fractures were classified according to Garden's classification , include grade I and II into one group (undisplaced) and grade III and IV into other group (displaced) .

11 patients were with undisplaced femoral neck fractures (55%) .

9 patients with displaced femoral neck fractures (45%).

The age of the patients was ranging from 20 – 50.

The causes of fractures were road traffic accident in 10 patients (50%),motor cycle accident 6(30%) and fall from height 4(20%).

Operative treatment:

All patients included in this study (20 patients) were subjected to surgical treatment.

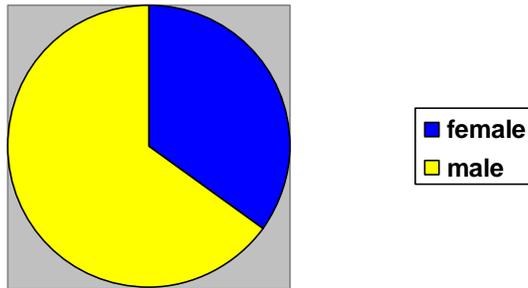
The patients were divided into two groups:
1- The first group their fractures were undisplaced or with slight or moderate displacement, Garden I and II and sometimes Garden III and IV .11 patients were included in this group and they were treated surgically by closed reduction and internal fixation with three cannulated screws.

2- The second group their femoral neck fractures was markedly displaced so we treated it by open reduction and cannulated screws fixation after failure of closed methods, 9 patients were included in this group.

Results:

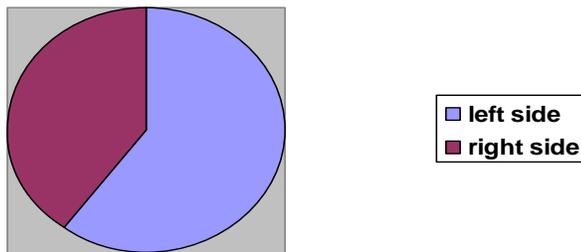
The patients number (20) with femoral neck fractures subjected to prospective study, 7 females 35%, and 13 males 65%.as shown in this figure (1)

chart for the sex of the patiens



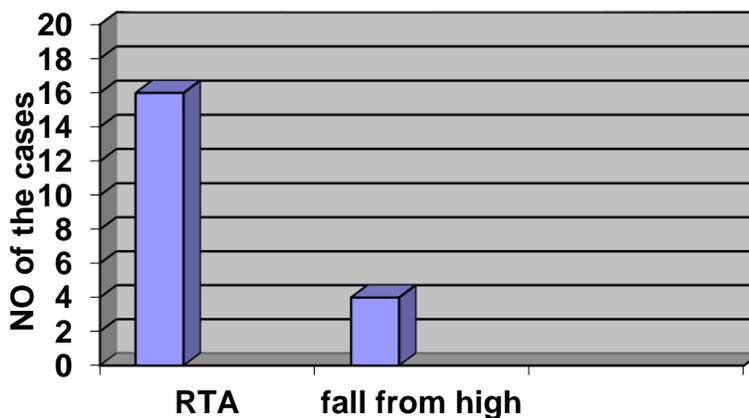
12 patients were left-side 60%, 8 patients were right-sided 40%. As shown in this figure(2)

chart for the site of the fractures



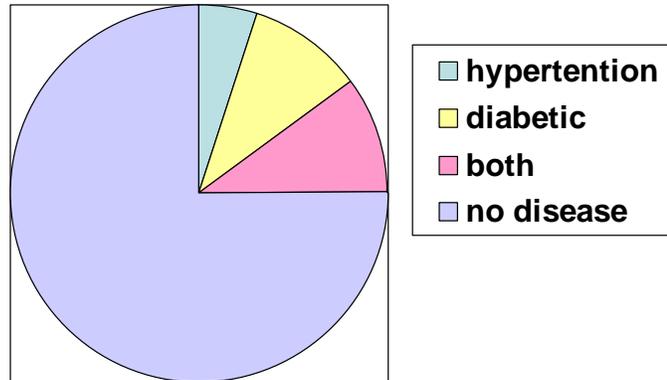
The causes of fractures were road traffic accidents in 16 patients (80%), and fall from height 4 (20%).as shown in figure(3)

Chart for the causes of the injury



The total number of patients with significant associated medical

diseases were 5 patients(25%) figure (4)



Pie chart II associated medical diseases

The patients divided in to two group first group non displaced fracture neck femur which include 11patients (55%) and other group displaced fracture including 9 patients (45%) .

healing was callus formation compared to that of preceding radiological examination of the 20 patients treated with cannulated screws , 17 patients (85%) showed clinical and radiographical criteria of healing within 6 months.

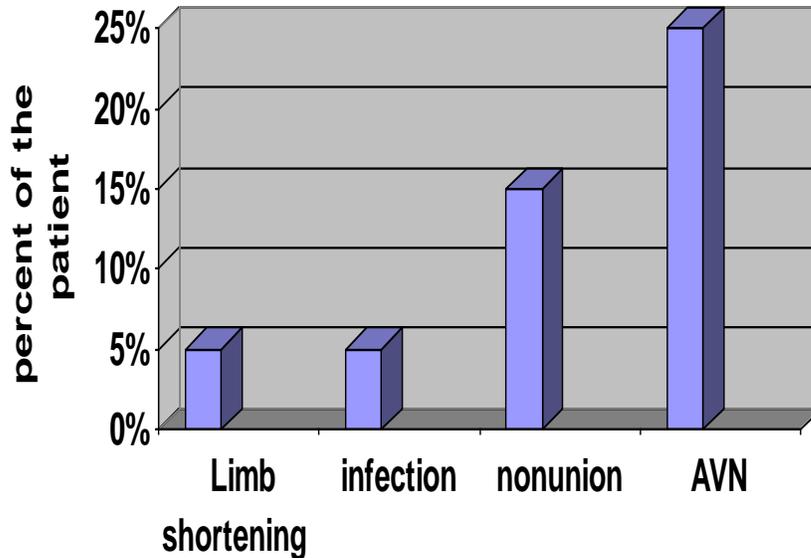
Complications

One patient developed contact dermatitis from the plaster of skin traction, so he was changed into skeletal traction.

Two cases of bed sore occurred during the preoperative period

Postoperative complications : as shown in figure(5)

chart post operative complication



*AVN(avascular necrosis)

Table II master table of displaced group :

Table III master table of non displaced group:

No.of patient	age	sex	side	Medical disease	cause	anesthesia	reduction	complication
1	20	female	left	non	RTA	GA	closed	Non
2	24	female	right	non	RTA	GA	closed	Non
3	28	female	left	non	RTA	GA	closed	Fixation failure
4	40	male	right	non	RTA	GA	open	Nonunion+AVN
5	42	male	left	non	RTA	GA	open	Infection
6	44	male	left	D.M	RTA	GA	open	Limb shortening
7	46	male	left	D.M	RTA	GA	open	Nonunion+AVN
8	46	male	right	hypertension	RTA	GA	open	Nonunion+AVN
9	49	male	left	Hypertension	Fall from height	GA	open	Non

No.of patient	age	sex	side	Medical disease	causes	anesthesia	reduction	complication
10	22	male	right	non	RTA	spinal	closed	non
11	25	male	right	non	RTA	spinal	closed	non
12	37	female	female	non	RTA	spinal	closed	non
13	35	female	female	non	RTA	spinal	closed	non
14	36	male	male	non	RTA	spinal	closed	non
15	39	male	male	non	RTA	GA	closed	non
16	40	male	male	non	RTA	GA	closed	non
17	45	male	male	non	RTA	GA	closed	non
18	48	male	male	non	Fall from height	GA	closed	non
19	50	female	female	non	Fall from height	GA	closed	AVN
20	50	female	female	DM+HT	Fall from height	GA	closed	AVN

Discussion:

The most important objective in the treatment of a displaced intracapsular fracture of the hip is to achieve stable osseous support of the femoral head on the femoral neck.

The fixation is used to increase stability by compressing the fracture and then maintaining the reduction neutralizing forces acting on the hip. purposes of the fixation screws are to lock the fracture in a position in which the femoral neck gives bone-on bone support to the femoral head-neck fragment, to prevent posterior and varus migration of the femoral head, and to be parallel so as to maintain position as the fracture settles in the healing period^(2,9,10)

In our study there are several reasons for use of a cannulated screw system:

(1) the smaller-diameter guide-pins can used to determine the screw position and length accurately ;

(2) cannulated screws systems improve the accuracy of screw placement by supplying jigs that can place guide pins very accurately;

(3) with parallel screws, excellent compression can be produced by the lag effect of the screws.

There are many option regarding number and configuration of screws insertion in treatment of femoral neck fracture . In our study the number and configuration of the screws are three screws because the stability at the site of the fracture is maximized by placement of three screws in an inverted triangular configuration with consider one inferior screw with two more superior screws.as it mentioned in study done by Crowell et al., of five paired cadaveric femora. and Benterud et al , in eight paired cadaveric femora. placed screws in different quadrants of the femoral heads. Tests were performed to study screw pull-out strength with the materials testing system The inferior portion of the femoral head consistently had a significantly lower screw pull-out strength ($p < 0.05$). the trabecular density of the central and superior quadrants of the femoral head provided better screw fixation. Placement of two or three screws in the inverted triangle and

diamond patterns provides better fixation in the dense bone of the femoral ^(11,12).

The two screws is insufficient for stable fixation while the fourth screw adds little in additional fixation ⁽¹³⁾.

Placement of three parallel cannulated screws peripherally around the femoral neck to compress the fracture and also yields excellent rotatory stability. Imperfect reduction of the fracture and comminution of the fragments increased the instability of the reduction. The goal of reduction is to obtain a position as close as possible to a Garden index of 160/180. The Garden index is an expression of the angle of the compression traeculae on the anteroposterior roentgenogram in relation to the longitudinal axis of the femoral shaft over the angle of the compression traeculae on the lateral roentgenogram in relation to the femoral shaft. The ideal angle should be 160 degrees in the anterior-posterior plane and 180 degrees in the lateral plane ⁽¹⁴⁾. A reduction is satisfactory when the medial part of the femoral neck and head are well supported by the medial cortex of the femoral neck either anatomically or with the cortex slightly medial to the neck.

Slight valgus angulation is acceptable while Varus angulation is not acceptable. varus reduction results in an increased non-union rate and this occurred in one of our cases that caused shorting of the limb and non union together with avascular necrosis;.

The distal screw should not enter the femoral cortex distal to the level of the lesser trochanter. since fractures can result from a crack in the distal holes .and many reported cases of subtrochanteric fracture had been occur .but in our study we did not had such complication ⁽¹⁵⁾.

The resultes of the displaced group was 15% nonunion and 15% of avascular necrosis while non of the nondisplaced group develop non union and 10% of vascular necrosis.

The findings of the current study regarding non union (15%) support that the quality of reduction has an impact on the outcome of

treatment. The outcome for patients with a fair or poor reduction was poor, it is important to recognize that problems that make it difficult to obtain a good reduction, such as comminution, marked displacement which may reflect more severe injury patterns.

Our result regarding nonunion is good when compared with other study done by Lu-Yao et al ,in meta analysis of 106 series non union was 23% to 37% of fractures and this is may be because most of the patient were with good healing potential and good bone quality of the femoral head and neck of most young patients. in this study

The number of the patients that developed nonunion were three patients (15%) all of them had avascular necrosis ,but from other point not all patient with avascular necrosis had non union ,and this may be due to the healing potential of fracture depend mainly on blood supply which already distributed in those patient with both avascular necrosis and non union while in other group of avascular necrosis alone Osteonecrosis remains the main complication following internal fixation of intracapsular fractures. A fracture of the femoral neck is accompanied by injury to the blood supply of the femoral head and it is believed that revascularization of the femoral head occurs after internal fixation. The 25% rate of osteonecrosis among patients with displaced fractures treated with open reduction and direct visualization of the fracture fragment and despite excellent reduction was achieved and capsulotomy was used the patient develop avascular necrosis. the same result was achieved by Tooke SM, Favero KJ about 27% of patient developed avascular necrosis and he has been speculated that the fate of the femoral head is partly determined at the time of injury ⁽¹⁶⁾.

Bonnaire et al ⁽¹⁷⁾. reported that 75% of the patients with a femoral neck fracture in their study had increased intra-articular pressure. They believed that an increase in joint pressure was associated with reduced perfusion of the femoral head. They suggested that there is an

increase in femoral head blood flow initiated by relief of the tamponade⁽¹⁸⁾. These studies suggested that intracapsular distention of the hip may be one cause of femoral head osteonecrosis⁽¹⁹⁾. Other studies, however, do not support the concept of increased intracapsular pressure as a major factor in the development of osteonecrosis⁽²⁰⁾. Maruenda et al⁽²¹⁾. They suggested that osteonecrosis may be a result of the vascular damage that occurred at the time of injury and not of the tamponade effect. We continued to perform capsulotomy because it is simple to perform, and it may theoretically help some of patients by decompressing the blood vessels supplying the femoral head as many studies recommend that.

The rate of avascular necrosis is high when it is compared with other study done by Lu-Yao et al, in meta analysis in which the rate of avascular necrosis is ranging from 11% to 19% and this may be related to the vessels injury at the time of the accident in addition to the open reduction for those patient who underwent open reduction might injured blood supply to head of femur because the vascular necrosis mainly occur in displaced fractures treated with open reduction.

Other factors that may leads to avascular necrosis is excessive valgus reduction which occurred in one patient and we blame also other factor as it cause avascular necrosis is the time factor, all our patient treated after(12hour) from the time of the injury because most of our patient was referred from other hospitals and also some cases received early with in 12 hour but, in our hospital treated as an elective surgery.

Preliminary skin traction was done for all patients before surgery to decrease pain, maintain position of fracture as possible and for easy transport while preparing patient to surgery, so some patient develop skin complication due to long period of traction up to 10days.

In three diabetic patient (15%), tow of them developed nonunion and this may due to poor

quality of bone and low potential healing capacity as it proved by many studies⁽²²⁾, and in our study we cannot determine that as the number of the patient in our study is small to decide that.

One of our patient develop infection, and this may be due to long duration of surgery to more than (2hour) due to technical difficulty in reduction because of displaced comminuted fracture, also the patient was obese and diabetic, and the use of antibiotics prophylactically reducing the incidence of postoperative infection.

Conclusion and recommendations

1-Osteonecrosis of the femoral head and nonunion are the two most common and challenging complications associated with femoral neck fractures. The fracture displacement and disruption of the femoral head blood flow are contributing factors that are outside of the surgeon's control.

2-The use of cannulated screws is effective method in treatment of fracture neck femur regarding union rate and low rate of other complication.

We recommend the following :

1- The key factors in the treatment of femoral neck fractures include early diagnosis, early surgery, anatomic reduction, capsular decompression, and stable internal fixation.

2-accurate reduction either by closed under fluoroscope control or by open reduction and under direct vision, to ensure perfect reduction as anatomical reduction to ensure good union rate and our aim valgus reduction but not beyond 185 degree garden index, and avoid varus reduction because it lead to non-union, increase risk of redisplacement of fracture and it can cause early fixation failure.

3-we recommend using cannulated screws as fixation method for intracapsular femoral neck fracture because it provide good stability by compressing the fracture by lag effect of screws and also maintaining the reduction

4-placement of three parallel cannulated screws peripherally around the femoral neck to

compress the fracture yields excellent rotatory stability and accuracy placement of screws .

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